

In replying please address:

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October 29, 1959

Dear Sir:

In accord with a recent discussion with your technical representatives, we are submitting herewith a proposed program of research directed toward an investigation of the feasibility of developing an appropriate instrument or apparatus and an associated technique, which might be used to

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The present state of the art in this area of interest is based on manipulative techniques which require highly developed skills depending directly on the human senses, particularly touch. Your technical representatives are interested in exploring the possibility that some apparatus might be devised to supplement and assist the human senses in connection with this type of operation. Such an apparatus might serve by measuring and indicating, with increased or equivalent sensitivity, the same quantities which are currently sensed, or other quantities which are inherent in the

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[REDACTED] It is likely that some device, such as was developed for a generally similar purpose under Work Orders Nos. III and X, Task Order No. CC, would greatly facilitate such an operation, particularly by decreasing the total time involved and also by increasing the proportion of successful attempts.

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A preliminary consideration of the problem suggests that a possibly applicable kind of device would be one which might operate by measuring torque. [REDACTED]

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The measurement of pertinent quantities other than torque might be used to accomplish the desired purpose, and should be considered also. Nondestructive testing techniques, covering a wide range of physical phenomena, have been developed and applied to many practical problems; fundamentally, such methods operate on the basis of some input of energy or "information" which is significantly modified by the structure being examined. In general, these techniques might be arbitrarily classified into three groups as follows:

- (1) Mechanical methods, which are based on measurements of forces, torques, motions, vibrations, sounds, and the like.

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- (2) Electromagnetic methods, which are based on utilizing the effects of electric and/or magnetic fields. Such fields might range in frequency from zero (for direct current) to those of X-rays or gamma rays. Included in this group are effects which might result in changes in electrical resistance or impedance, in shadowing or scattering phenomena, in the development of eddy currents, or in optical phenomena.
- (3) Thermal methods, which are based on measurements of heat flow and temperature gradients as affected by the structure. Most of these techniques are quite analogous in principle to the above-outlined electrical methods.

From the viewpoint of the problem of interest, consideration of the many ideas stemming from these three general categories would probably result in several being discarded for some obvious reason; for example, on the basis of your technical representatives' experience, any interest in X-rays or gamma rays should probably be abandoned. Other ideas would require more study in order to achieve a reasonable evaluation of their potential usefulness in the application of interest. It is possible that some idea might be considered fairly promising, but that a relatively ambitious experimental program might be required to determine its feasibility.

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Your technical representatives are interested in an evaluation of the possibility of developing an appropriate instrument or apparatus and an associated technique for use as generally described above. The research program proposed herein describes a feasibility study directed toward investigating this area of interest.

As currently contemplated and as discussed with your technical representatives, the proposed program would be directed toward a cursory experimental investigation of the possible applicability of torque measurements to the problem; and then, within the limits of the funds and time remaining, a "paper study" type of consideration would be given to the potential usefulness of measurements of some of the more promising other quantities mentioned above.

In the cursory laboratory study of torque measurements, the type of experiments conducted would be generally similar to those performed previously under Work Order No. III, Task Order No. CC. Equipment and laboratory setups which could be readily and economically procured and assembled would be used. The proposed experimental effort would be concentrated on  provided to us by your technical representatives on October 15, 1959.

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Every attempt would be made to explore the potentialities of torque measurements as quickly and as economically as possible. Then, to the extent permitted by the time and funds provided, a cursory examination would be made of a few of the other possibly applicable quantities; the characteristics of these quantities would be reviewed, calculations, if pertinent, would be made, and any other type of consideration which might be appropriate would be applied.

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Efforts would be made to arrive at some estimate of the potentialities of the quantities examined. However, it should be emphasized that the amount of effort that could probably be applied to consideration of quantities other than torque measurements is likely to be extremely limited.

Your technical representatives would be kept informed of the activity under the proposed program by discussions during their periodic visits and via telephone. At the conclusion of the proposed research period, a letter report would be submitted that summarized the highlights of the activity performed and the results obtained; also, any recommendations for additional research that appeared to be appropriate would be included.

We propose to undertake this effort over a period of four months, starting on the date of acceptance of authorization from the Contracting Officer to proceed. The proposed investigation could be conducted under Task Order No. KK. The Work Order would be a period-basis research agreement; it could be similar in form to that used previously under Task Order No. KK and the same administrative procedures would be followed. The Work Order would require only that the research be directed toward the objective outlined above, within the limits of the time and funds provided.

It is estimated that an appropriation of \$2,999, including the fixed fee, would be needed to fund the proposed program for the four-month period. A general breakdown of the estimated costs is attached.

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If any additional information is needed, please let us know. You may direct any inquiries of a contractual nature to  at Extension 159.

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Very truly yours,

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KEB:alm

In Duplicate

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Proposal of  to **the U. S. Government.**  
 For Research on **Study of the Feasibility of Developing Instrumentation**  
**for Use**

Based upon a period-basis Contract for a research period of **four months.**

(Including time for submission of all reports. The proposed contract will not provide for earlier conclusion of the research.)

### ESTIMATED COSTS

We expect that the cost of this research for the period indicated above may be distributed approximately as set forth hereon, subject to the understanding that this allocation is merely an estimate, and actual costs incurred may vary from the categories shown. We have determined that these estimates are reasonable and consistent with  established policies in its research for the various Government agencies, which policies are briefly discussed below and will be followed in determination of our actual costs hereunder.

#### Materials & Supplies, etc.

(Including any equipment which may be purchased as necessary in performance of the research. Charges of \$25 or less are excluded from this item.)

#### Use of Equipment and Technical Services, Travel, and Misc.

(Including applicable costs of technical research and service divisions, and use of technical equipment, except that any undistributed balances of these accounts will be included in overhead. Cost of travel includes reasonable actual subsistence expenses and the actual cost of transportation. An allowance of up to 8¢ per mile for all necessary travel by privately owned conveyance is included in lieu of the cost of such travel.)

#### Salaries & Wages

(Including our predetermined accrual for vacation, holiday, and sick-leave pay, pensions, and social security.)

<i>Type of Employee</i>	<i>No. of Man-Months</i>	<i>Estimated Cost</i>
Supervision	1/4	<div style="border: 1px solid black; width: 80px; height: 60px; margin: 0 auto;"></div>
Research Engineers	1	
Lab. Assistants	1-1/4	
Steno., Clerical, Shop & Photo., etc.	Nominal	
<b>Total Salaries &amp; Wages</b>		<u>Nominal</u>

#### Overhead

59 per cent of salaries and wages, as they are defined above. Provisional monthly reimbursement will be at the rate of 59 per cent of salaries and wages, as so defined, or at such other provisional rate as may from time to time be mutually agreed upon with the Government's audit representatives. This is a provisional rate for current reimbursement, which we have arrived at by negotiation with Government representatives, and it will be subject to retroactive revision to the "actual" rate agreed upon with them for each calendar year following a detailed audit for that year. The item of overhead includes general research, charges of \$25 or less for materials and supplies, and other categories of costs we customarily include in our overhead account. Cash discounts on all purchases will be credited to overhead, instead of to the amount of the purchase. Scrap of appreciable value will be credited directly to the project. All other scrap will be credited to the overhead account, in which the Government participates.)

**Total Estimated Cost**

**Fixed Fee**

\*Please let us have your acceptance in our hands by **December 15, 1959.** **Contract Price**  
 Unless we extend the time, your acceptance after that date will be subject to agreement.

**\$2,999**

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